Remarks

Claims 1-5, 9-16, and 20-22 are currently pending. Claims 6-8 and 17-19 were previously withdrawn.

Rejections under 35 U.S.C. §103(a)

The Examiner has rejected claims 1, 3/1, 4-7, 14, 20/14, 21/14, 2, 3/2, and 9 under 35 U.S.C. §103(a) as unpatentable over Rohrback '771 in view of Rohrback '348 and further in view of Farrell (GB 2 262 608). Farrell et al. is cited by the Examiner as teaching that "corrosion sensor usage is desirable in the boiler, furnace industries."

As noted previously, Rohrback '771 teaches a probe that includes a corroding element and a shielded reference element for temperature compensation. Both elements are formed as metal films on a substrate. A non-conductive substrate that is rigid and resistant to chemical attack and "high" temperatures is taught at column 3, lines 18 to 20. No further teaching is provided to indicate the meaning of "high" temperature. However, none of the preferred substrate materials disclosed at column 1, lines 65 to 71 are suitable for use in a high temperature boiler or furnace environment where surface temperatures may reach 800 to 1000 °F. Rohrback '348 teaches basically the same substrate materials as discussed in the '771 patent and offers no further teaching that would suggest modification of the probes described in either reference to produce the system of the present invention that is adapted for extreme high temperature applications such as in a boiler. Rohrback '348 teaches substantially similar substrate materials as discussed in the '771 patent and offers no further teaching that would suggest modification of the probes described in either reference to produce the system of the present invention that is adapted for extreme high temperature applications such as in a boiler.

Applicant respectfully traverses the pending rejection one the grounds that the Examiner has not established a proper *prima facie* case for obviousness because there would have been no motivation to combine the cited references. A proper *prima facie* case under 35 U.S.C. 103(a) requires that either the cited references or other knowledge available to one skilled in the art at the time of the present invention would have provided the necessary motivation to combine or modify the teachings of the references to produce the claimed invention. Farrell et al. discusses an approach similar to that of Rohrback et al. on pages 1 and 2 in the "Background" section of

the published application. Specifically, Farrell et al. describes a transducer comprising first and second conductive elements wherein the first, corroding element is in physical contact with the boiler environment and the second, reference element is physically isolated but in thermal contact with the boiler environment. On page 2, Farrell et al. identifies this design as disadvantageous in a boiler application. Specifically, Farrell et al. note that "small but significant differences in temperature exist between the corrosive and reference elements" that introduce significant errors in the resistance measurement and thereby "render the corrosion rate measurement technique useless." To combat these identified problems, Farrell et al. teach a transducer comprising "a single electrically conductive element. No reference element is required." Though Farrell et al. does identify the need for corrosion measurements in a boiler application, no teaching or suggestion is provided in Farrell et al. or in any of the other cited references that would have suggested to one of skill in the art that the disadvantages taught by Farrell et al. could be overcome in the manner provided by the presently claimed invention.

Application further traverses this rejection because the *prima facie* case for obviousness fails due for a lack of a reasonable expectation of success because, Farrell et al. specifically and forcefully teaches away from the present invention as a whole and specifically describes important perceived disadvantages to application of the Rohrback method for corrosion measurements in a boiler environment. A proper *prima facie* case for obviousness requires that one of skill in the art would reasonably expect that the modification to the prior art suggested by the Examiner would produce a useful, operative invention. References cannot properly be combined where the references teach away from their combination. *In re Graselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983); MPEP § 2145(X)((D)(2). Farrell et al., at page 2, line 10 to page 3, line 3, asserts that corrosion measurement transducers having a protected, reference element and an exposed, corroding element are not suited for use in a boiler environment. Farrell et al. specifically notes at lines 14-18 on page 2 that because temperature gradients will be established along the length of the probe

> Small but significant differences in temperature exist between the reference and corrosion elements contained in the transducer which lead to significant errors in the resistance measurement.

At the top of page 3, Farrell et al. note that these temperature related errors "render the corrosion rate measuring technique ***useless***" (emphasis added). Based on these teachings, one of skill in

the art could hardly entertain a reasonable expectation of success for a corrosion measurement method based on resistance differences between a corroding and reference element similar to that claimed in the present application. In fact, the most reasonable inference that could be drawn from Farrell et al. is that an apparatus as presently claimed would be doomed to failure. The present invention as claimed in claims 1 and 14 overcomes the perceived disadvantages described by Farrell et al. by providing "long and narrow" thin film resistive elements that experience identical temperature conditions even under the very rapidly varying thermal environment of a boiler. As such, Applicant respectfully submits that independent claims 1 and 14 are patentable over the cited art. All other pending claims depend from and therefore include the limitations of these independent claims and should therefore also be in condition for allowance.

The Examiner has also rejected Claims 11-13 under 35 U.S.C. §103(a) as unpatentable over Rohrback '771 in view of Rohrback '348, and further in view of Farrell, and further in view of Schmidt. Applicant traverses this rejection for the reasons stated above in reference to the Farrell et al. reference. Schmidt does not teach film elements for the corroding and reference electrodes at all. Rather, the use of "elements...constructed out of materials with similar temperature coefficients" is disclosed at column 1, lines 33 to 35. Schmidt also teaches a technique of compensating for temperature-related resistance effects at "room temperature" (column 5, line 25). As such, Schmidt also does not teach or provide motivation for adaptation of the Rohrback probes for use in the extreme high temperature conditions for which the present invention is suitable. Applicant therefore respectfully requests that this rejection be withdrawn.

Finally, the Examiner has rejected claims 10/1, 10/2, 15, 20/15, 21/15, 16, 20/16, and 21/16 under 35 U.S.C. §103(a) as unpatentable over Rohrback '771 in view of Rohrback '348, and further in view of Farrell, and further in view of Caldecourt. Applicant traverses this rejection for the reasons stated above in reference to the Farrell et al. reference. Caldecourt's teaching is limited to the use of "porous paper impregnated with a resin" (column 2, lines 15-16) to serve as an insulator between the reference and corroding elements. The addition of "particulated aluminum oxide or beryllium oxide to the resin" as disclosed at column 2, lines 63 to 64 is intended merely to improve the heat conductivity of the insulating layer, not to modify the disclosed apparatus for extreme high temperature applications. As such, Caldecourt does not

suggest or teach the modifications necessary to produce the instantly claimed invention based on the cited references and Applicant respectfully submits that this rejection should be withdrawn.

Finally, Applicant respectfully submits that the teachings of Morowaki in regards to ceramic material having a "high heat conductivity" are not sufficient to have provided motivation to modify the other cited references to yield the presently claimed invention. As noted above in regards to Farrell et al., the state of the art at the time of the present invention focused on temperature compensation algorithms and software routines to determine corrosion rates based on resistance measurements of solid metal electrodes. The approach previously described by Rohrback et al. for use in low temperature, solution-based applications was identified as unsuitable for high temperature environments for the reasons outlined in Farrell et al. The present application describes a novel and unobvious solution to the problems of corrosion measurement in fireside environments that is substantially less susceptible to the problems of small scale temperature differences. The apparatus of the present invention is also a substantial improvement over the apparatus described by Farrell which the present inventors initially but unsuccessfully attempted to employ for making corrosion measurements.

In view of the foregoing discussion, it is respectfully submitted that this application is now in condition for allowance, and favorable consideration is requested. If any matters can be resolved by telephone, the Examiner is invited to call the undersigned agent at the telephone number listed below. The Commissioner is hereby authorized to charge any other fees determined to be due to Deposit Account 50-2319 (Order No. A-69489/AJT/MDV (465070-1189)).

Respectfully submitted,

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